3GPP TSG-RAN WG4 Meeting #98-e R4-2103766

Electronic Meeting, 25 January – 5 February 2021

**Agenda item:** 9.25.4.2, 9.25.4.3, 9.24.4

**Source:** Moderator (Ericsson)

**Title:** Email discussion summary for [98e][327] NR\_R17\_SpectrumWI\_Demod

**Document for:** Information

# Introduction

This email discussion targets to discuss the UE/BS demodulation requirements for Rel-17 spectrum WIs.

Candidate targets of email discussion is listed as follows:

* 1st round:
  + Discuss the impact to UE/BS demodulation requirements for 47GHz (n262).
  + Discuss the CR for UE demodulation requirements of PC5 UE in n257/n258.
* 2nd round:
  + Discuss the way forward if necessary.

# Topic #1: UE demodulation on FR2 FWA UE with maximum TRP of 23dBm for band n257 and n258 (9.24.4)

## Companies’ contributions summary

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| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2101423 | Ericsson, SoftBank | Rel-17 CR to add Noc value PC5 for n257/n258. |

## Open issues summary

N/A

## Companies views’ collection for 1st round

Please provide comment in 1.3.1.

### CRs/TPs comments collection

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| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2101423 | Huawei: Fine for us. |
| Company B |
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## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

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|  | **Status summary** |
| **Sub-topic#1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

*Recommendations on WF/LS assignment*

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|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 |  |  |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provides recommendation on CRs/TPs Status update*

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| **CR/TP number** | **CRs/TPs Status update recommendation** |
| R4-2101423 | *Agreeable* |

## Discussion on 2nd round (if applicable)

No 2nd round discussion.

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

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| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

# Topic #2: UE demodulation on NR 47 GHz band (9.25.4.2)

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2102933 | HUAWEI TECHNOLOGIES Co. Ltd. | **Proposal 1: Further evaluations are needed to confirm if the existing UE demodulation requirements applicable for 47GHz band or not.**  **Proposal 2: Take the REFSENS agreement for Noc power level calculation for 47GHz band.** |
| R4-2102100 | Ericsson | Text proposal to TR 38.847 |
| R4-2102100 | Ericsson | Rel-17 CR:   * Add Noc value added for n262. * Revise the frequency range for performance requirements extended from 40000 to 48200 MHz. |
| R4-2100565 | Nokia, Nokia Shanghai Bell | *Comments by moderator: This Tdoc also discusses UE demodulation requirements.*  **Proposal 1: Existing demodulation minimum performance requirements are reusable for 47GHz band.**  **Observation 1: In our understanding of the UE demodulation SNR range calculation tools, the maximum allowable BB SNR is reduced from the previously estimated 20dB to 13.4dB.**  **Proposal 2: RAN4 to continue discussing the OTA demodulation performance testing limitations for the 47GHz band during RAN4#98.** |

## Open issues summary

### Sub-topic 2-1

**Issue 2-1: Whether the existing UE demodulation requirements applicable for 47GHz band or not.**

* Proposals
  + Option 1: The existing UE demodulation requirements are applicable for 47GHz (n262) also.
  + Option 2: Need further evaluation.
    - Need evaluation with MCS18 Rank1 (i.e. Test 1-3 in Table 7.2.2.2.1-3 of TS 38.101-4) and MCS17 Rank2 (i.e. Test 2-6 in Table 7.2.2.2.1-4) with the phase model captured in TR 38.803.
  + Option 3: Need further evaluation.
    - Limit the CBW to 50MHz or limiting the testable SNR to 13.4dB.
* Recommended WF
  + Collect companies view.

**Issue 2-2: Noc power level**

* Proposals
  + Option 1: Take the REFSENS agreement for Noc power level calculation for 47GHz band
* Recommended WF
  + Set Noc level for n262 in TS38.101-4 Table 4.5.3.2-1 based on REFSENS.

## Companies views’ collection for 1st round

### Open issues

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| **Company** | **Comments** |
| Ericsson | **Issue 2-1: Whether the existing UE demodulation requirements applicable for 47GHz band or not**  If companies want more time to check that is OK, but we prefer not to mandate the PN model to consider (companies can take the PN model they think suitable).  Regarding the testable SNR; there is a discussion in RAN5 about the testable SNR for FR2. We should encourage RAN5 to consider also n262 in that discussion.  **Issue 2-2: Noc power level**  Agree with recommended WF. |
| Nokia, Nokia Shanghai Bell | **Issue 2-1: Whether the existing UE demodulation requirements applicable for 47GHz band or not.**  We would like to request further time to evaluate the n262 testing link budget.  It would be very helpful for RAN5 and the TE vendors to provide feedback here.  The phase noise model should be left up to implementation by the contributing entity. |
| Rohde & Schwarz | **Issue 2-1:** Regarding the SNR discussions, we believe that the estimate from Nokia is too high. We have provided our analysis for the existing frequency bands as a pre-meeting document on the RAN5 mail server.  Based on that estimation and using -79.3 dBm/100 MHz as REFSENS value (as proposed by majority of companies in this meeting), we would estimate around **12dB SNR for 100 MHz** bandwidth for a signal under AWGN conditions. For TCs with fading RAN5 is currently discussing how much further backoff from the P1dB of the amplifier is needed, with current working assumption being 10dB. So for TCs with fading and AWGN the available SNR will shrink further depending on the final RAN5 agreement.  This is only a preliminary estimate since additional effects like increased cabling losses or amplifier P1dB at around 47 GHz need further studies. |
| Qualcomm | **Issue 2-1: Whether the existing UE demodulation requirements applicable for 47GHz band or not**  This will require further analysis, and we also think that PN model should be left up to UE implementation.  We understand that the maximum SNR of 12dB is including Noc, does Rohde & Schwarz have an estimate of the maximum achievable SNR in Mode 2 test setup (so no external noise transmitted) for AWGN channel?  **Issue 2-2: Noc power level**  Agree with the recommended WF, pending the approval of related REFSENS values during this meeting; |
| Huawei, HiSilicon | **Issue 2-1: Whether the existing UE demodulation requirements applicable for 47GHz band or not**  Further analysis is needed, although the PN model should be left up to UE implementation, but companies should fully considered the impact caused by higher frequency. During the evaluations, the PN models for FR2 captured in in TR 38.803 can be used by companies as did for NR Rel-15 UE demodulation performance requirements definitions. Common simulation assumptions are needed for the following evaluations, like we suggested:  Use MCS 18 Rank 1 (i.e. Test 1-3 in Table 7.2.2.2.1-3 of TS 38.101-4) and MCS 17 Rank2 (i.e. Test 2-6 in Table 7.2.2.2.1-4) for FR2 64QAM performance requirements.  **Issue 2-2: Noc power level**  Agree with the recommended WF that depends on the REFSENS agreements. |

### CRs/TPs comments collection

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| **CR/TP number** | **Comments collection** |
| R4-2102100 (CR to TS 38.101-4, Ericsson) | Huawei: It is a little early to add the Noc power level without agreements for REFSENS for n262; whether the existing performance requirements can be extended to DL frequency not exceeding 48200MHz depends on further evaluations. |
| Company B |
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| R4-2102101 (pCR to TR38.847, Ericsson) | Huawei: It is better to postponed to next meeting. Evaluation results from all interesting companies can be captured in the TR later based on the common assumptions. |
| Company B |
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## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

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|  | **Status summary** |
| **Sub-topic 2-1** | **Issue 2-1: Whether the existing UE demodulation requirements applicable for 47GHz band or not**  Most companies request a time for evaluation. Moderator proposes the way forward as below. The detailed wording is discussed in the 2nd round.  Tentative way forward:   * RAN4 to evaluate whether the existing UE demodulation requirements are applicable for 47GHz band or not.   + For evaluation, use MCS 18 Rank 1 (Test 1-3 in TS38.101-4 Table 7.2.2.2.1-3) and MCS 17 Rank 2 (Test 2-6 in Table 7.2.2.2.1-4) in 47GHz band (n262) as an example.     - Other scenarios are not precluded     - Phase noise (PN) model is up to UE implementation.   Recommendations for 2nd round:   * Discuss the detail of way forward.   **Issue 2-2: Noc power level**  Tentative agreements:   * Set Noc level for n262 in TS38.101-4 Table 4.5.3.2-1 based on REFSENS   No 2nd round discussion on this issue. |

*Suggestion on WF/LS assignment*

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|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 | Way forward on UE/BS demodulation on NR 47GHz band | Ericsson |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provided recommendation on CRs/TPs Status update suggestion*

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| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |
| R4-2102100 | *Postpone* |
| R4-2102101 | *Postpone* |

## Discussion on 2nd round

Work on the way forward.

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

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| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

# Topic #3: BS demodulation on NR 47 GHz band (9.25.4.3)

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2102102 | Ericsson | Text proposal to TR 38.847 |
| R4-2102935 | HUAWEI TECHNOLOGIES Co. Ltd. | **Observation 1: If MU and TT, ΔOTAREFSENS, EISREFSENS\_50M and ΔFR2\_REFSENS values for 47GHz band are updated, corresponding requirements in TS 38.141-2 need to be updated.**  **Proposal 1: Further evaluations can be conducted to confirm if the existing BS performance requirements applicable for 47GHz band or not.** |
| R4-2100565 | Nokia, Nokia Shanghai Bell | **Proposal 1: Existing demodulation minimum performance requirements are reusable for 47GHz band.**  **Observation 1: In our understanding of the UE demodulation SNR range calculation tools, the maximum allowable BB SNR is reduced from the previously estimated 20dB to 13.4dB.**  **Proposal 2: RAN4 to continue discussing the OTA demodulation performance testing limitations for the 47GHz band during RAN4#98.** |

## Open issues summary

### Sub-topic 3-1

**Issue 3-1: Whether if the existing BS performance requirements applicable for 47GHz band or not.**

* Proposals
  + Option 1: The existing BS demodulation requirements are applicable for 47GHz (n262) also.
  + Option 2: Need further study of the phase noise and carrier frequency for higher MCS.
* Recommended WF
  + Collect companies view

**Issue 3-2: Update TS38.141-2.**

* Proposals
  + Option 1: Update TS38.141-2 if MU and TT, ΔOTAREFSENS, EISREFSENS\_50M andΔFR2\_REFSENS values for 47GHz band are updated
* Recommended WF
  + Agree with Option 1.

## Companies views’ collection for 1st round

### Open issues

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| **Company** | **Comments** |
| Ericsson | **Issue 3-1: Whether if the existing BS performance requirements applicable for 47GHz band or not**  We support option 1; BS performance requirements have already been decided to be applicable up to 52GHz.  **Issue 3-2: Update TS38.141-2**  We do not believe that the MU and TT is likely to change (it is only the MU of the signal generator and fading channel emulator) but it could be checked. The EIS\_refsens is declared and the delta\_FR2\_refsens is always 3dB. So it may be that no change is needed unless some change to MU is motivated. |
| Nokia, Nokia Shanghai Bell | **Issue 3-1: Whether the existing BS demodulation requirements applicable for 47GHz band or not.**  We would like to request further time to evaluate the n262 testing link budget.  It would be very helpful for RAN5 and the TE vendors to provide feedback here.  The phase noise model should be left up to implementation by the contributing entity.  **Issue 3-2: Update TS38.141-2.**  We can’t really follow option 1. Yes, if MU and TT change for n262 then those should be changed in 141-2. However, the FR2 OTA requirements (BS type 2-O) are independent of ΔOTAREFSENS. Furthermore, changes to EISREFSENS\_50M and ΔFR2\_REFSENS are “automatically” included in the AWGN levels and there are no other demod dependencies to these values.  Can the proponents of option 1, give more details (or examples) of how changes to the listed values should be captured in the specification?  ==== 2nd set of comments ====  **Issue 3-1 and Issue 3-2:**  With the absolute power values required (-49dBm in Ericsson’s pCR, but likely more for 200MHz CBW worst case), there is a risk to saturate the front end of the DUT.  Injected noise floor is the root cause and might need to be reduced. Further investigation is required. |
| Samsung | **Issue 3-1: Whether if the existing BS performance requirements applicable for 47GHz band or not**  We support option 1. The impact of phase noise has already included the companies impairment results, the exiting BS performance requirements can be applicable for 47GHz  **Issue 3-2: Update TS38.141-2.**  Depending on output from the RF discussion, if there is some update for MU and TT, the related requirement for 38.141-2 should be updated. |
| ZTE | **Issue 3-1: Whether if the existing BS performance requirements applicable for 47GHz band or not.**  Option 1. The existing BS demodulation requirements are defined in a band-agnostic way. We don’t see the need of further study.  **Issue 3-2: Update TS38.141-2.**  ΔOTAREFSENS and EISREFSENS\_50M are vendor declared values, no spec impacts. ΔFR2\_REFSENS is a fixed value. No more change for these three parameters.  For MU and TT, in current 38.141-2, there are some of core requirements covering only up to 43.5GHz which may require updating. |
| Huawei | **Issue 3-1: Whether if the existing BS performance requirements applicable for 47GHz band or not.**  We prefer Option 2.  During NR Release 15 discussion, there are lots of discussions on PN modelling, at last, RAN4 agreed not to implicitly model PN during the simulations, and companies are encouraged to consider the PN impact in their submitted impairment results. n262 with higher frequency than bands introduced in Release 15, and PN impact has close association with higher frequency and MCS, we need to check if all companies fully considered the PN impact due to higher frequency in their impairment results. From our point of view, we would like more time to check if the existing performance requirements are still feasible for n262.  **Issue 3-2: Update TS38.141-2.**  Maybe MU and TT will be no change, but we it should be based on the final agreements in RF session.  For the ΔOTAREFSENS, EISREFSENS\_50M andΔFR2\_REFSENS values, like commented by other companies, ΔOTAREFSENS, EISREFSENS\_50M are based on vendor’s declaration, no further updates are needed. ΔFR2\_REFSENS = -3 dB is assumed for existing FR2 demodulation requirements definition, also no further updates are needed. |

### CRs/TPs comments collection

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| **CR/TP number** | **Comments collection** |
| R4-2102102 (pCR to TR38.847, Ericsson) | Nokia: Postpone until values and model are confirmed; either still in this meeting or the next. “Endorsement” might also be possible, since it does not lead to immediate implementation in the TR. Feedback from TE vendors would be highly appreciated. |
| Huawei: It is better to postpone it to next meeting based on further checking or evaluations from companies, considering this is the first time to have dedicated demodulation performance AI for this topic discussion. |
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## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic 3-1** | **Issue 3-1: Whether if the existing BS performance requirements applicable for 47GHz band or not**  Options:   * Option 1: The existing BS demodulation requirements are applicable for 47GHz (n262) also. * Option 2: Need further study of the phase noise and carrier frequency for higher MCS.   Most companies support Option 1. Moderator recommends continuing the discussion in the 2nd round.    *Recommendations for 2nd round:*   * Continue the discussion whether the existing BS performance requirements are applicable for 47GHz or not. * Discuss the pCR to TR38.847 can be endorsed or not.   **Issue 3-2: Update TS38.141-2**  Tentative agreements:   * No updates on ΔOTAREFSENS, EISREFSENS\_50M and ΔFR2\_REFSENS, are expected for n262. * MU and TT may need to be updated according to the conclusion in RF session.   No 2nd round discussion expected. |

*Suggestion on WF/LS assignment*

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|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 |  |  |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provided recommendation on CRs/TPs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |
| R4-2102102 | *Return to* |

## Discussion on 2nd round

**Issue 3-1: Whether the existing BS performance requirements are applicable for 47GHz band or not.**

* Proposals
  + Option 1: Keep the existing RAN4 assumption that BS requirements are applicable up to 52.6GHz.
  + Option 2: Need further study whether the existing BS performance requirements are applicable for 47GHz band or not.
* Recommended WF
  + Collect companies view

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

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| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| R4-2102102 | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |